# The Effect of Behaviour in Patients Who Are Hospitalized and Suffer from Alcohol Withdrawal

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**Abstract**

*Background:* Several mental illnesses, such as schizophrenia, anxiety, insomnia, hallucination and depression, appear when people heavily consume alcoholic beverages for weeks, months, or years. This behaviour appears in up to 80% of patients who are alcohol dependent and is called alcohol withdrawal. It can appear in patients hospitalized between 8hrs and 3 weeks, depending on the stage of their alcohol dependence. More than 90% of alcohol withdrawal signs and symptoms occur within 48 hours after the patient stops drinking. Every year,500,000 episodes of withdrawal symptoms are estimated for1.2 milion patients hospitalized. It is very important to know that over 50% of patients with alcohol withdrawal syndrome are middle-class, highly functional individuals.The withdrawal period can mean additional stress for the pacient who presents injury and needs to undergo surgical procedures. Poor healing increases the risk for infections, complications and prolonged hospitalization. Stress and other behavioral factors can also affect wound healing. Consequently, it is very important to speak about the dangers to which other patients are exposed, such as bites that can transmit hepatitis, syphilis, HIV, and the physical aggressions on health professionals. For patients who are heavy alcohol drinkers, the risk is the same because anxiety can the slowing of respiration and increases pulmonary risks. Also, the decreased activity increases the risk of thrombosis and of bowel upset.

*Conclusion. This type of patients should be treated like normal patients, but it is* necessary for them to stay as isolated as possible in order not to put the lives of others in danger.

## 1. Background

WHO defines excessive drinking as the consumption of at least 60 grams of pure alcohol in men or 40 grams of pure alcohol in women at least once in the last 30 days. Romania ranks 5th in the top of countries with an excessive type of alcohol consumption [1].

Although it is widely accepted that low doses of alcohol would have a beneficial effect on the cardiovascular system, the level of these doses is not accurately established. In general, a

reduction in cardiovascular risk was observed for daily doses of about 10 grams of pure alcohol (one dose of beverage) [2,3]. A glass of wine daily brings a sufficient intake of resveratrol, estrogen or quercetin to be considered a constant consumption of substances that may influence bone metabolism [4].

Resveratrol is considered to be the strongest antioxidant, 4 to 5 times stronger than betacarotene, 50 times than Vitamin E and 20 times than Vitamin C. It removes free radicals from the body, normalizes the level of fluids in the blood, improves blood circulation, arteries remaining elastic, lowers bad cholesterol and increases the level of good cholesterol. Resveratrol also has a powerful anti-inflammatory and antibacterial effect.

There are discrepancies in the way we perceive the effects of high alcohol consumption (affecting family and social relations, costs, problems at work) and the social costs incurred by family or other people close to the chronic consumer (cost of treating diseases secondary emerging, low family income) due to the fact that the effects have an insidious onset.

Alcohol is metabolized by the liver and eliminated through urine. An excessive amount of alcohol cannot be metabolized and it is absorbed by other parts of the body, such as the brain. The symptoms of alcohol withdrawal may vary from mild to severe. Consequently, when alcohol impacts the brain, consumers may feel happiness and relaxation, but also present symptoms of drunkenness (memory lapses, difficulty walking) and severe physical and psychological symptoms, depending on the quantity of alcohol, on how long the person has been abusing it, consumption frequency, polydrug use or history with addiction to other substances.

Alcohol abuse affects dopamine and GABA release:

- GABA (gamma-aminobutyric acid) produces endorphins in the brain, which leads to a state of well-being and is the primary neurotransmitter tied to the production of feelings like relaxation. In chronic alcohol consumers there is an imbalance in GABA production resulting in a negative psychological and physical symptomatology (withdrawal): headaches, agitation, anxiety, heart palpitations, confusion. During alcohol withdrawal, the brain releases glutamate (an excitatory neuron) to compensate for the alcohol's enhancement of GABA in the brain, which seems to cause delirium tremens [5].
- Dopamine is related to the body's reward system, regulating the energy, motivation, enjoyment and assists to body's sense of attention, cognition and mood. Alcohol releases dopamine, and with the increase of dopamine also occurs the alcohol dependence of the body due to the fact that the brain craves the happy feelings.

Alcohol withdrawal symptoms can occur as early as two hours after the latest drink, but tipically the peak is between 24 and 72 hours.

The timeline for common withdrawal symptoms is:

a) 6 to 12 hours post-ingestion
   - agitation
   - anxiety
   - headaches
   - shaking
   - nausea and vomiting;

b) 12 to 24 hours post-ingestion
   - disorientation
   - hand tremors
   - seizures;

c) 48 hours post-ingestion
   - grand mal seizures
   - insomnia
   - high blood pressure
   - tactile, auditory and visual hallucinations

- high fever and excessive sweating
- delirium tremens including sudden mood changes, excitement, altered mental functions, fear, deep sleep [6].

These symptoms raise serious integration problems and create a high level of stress on the family as well as on those with whom they come into contact.

In the case of operated patients, besides the surgical stress, the stress caused by the presence of the osteosynthesis material, this level of discomfort and mental stress affects multiple systems, including healing and ossification (the main aspects pursued in this article).

## 2. Stress Response to Physical Stress and Mental Stress

Generally, stress can be defined as an imbalance between a living organism and its environment. The response is characterized by activation of the sympathetic nervous system (SNS) and increased secretion of the pituitary gland.

The metabolic effect of hormonal changes is increased catabolism.

The response to stress proceeds to one of the peripheral catecholamine systems (sympathetic-nervous system, sympathetic-adrenal-medullar system, and dopamine systems) through the autonomic nervous system.

Stress response is driven by the synaptic input from different brain regions (the limbic system – hippocampus, amygdala; brainstem) and performed on five endocrine axes:

- hypothalamic–pituitary–adrenal (HPA),
- hypothalamic–pituitary–thyroid (HPT),
- hypothalamic–pituitary–gonadal (HPG),
- hypothalamic–pituitary–somatotropic (HPS), and
- hypothalamic–pituitary–prolactin (HPP) [7].

Hypothalamic releasing factors stimulate the pituitary gland and synthesize ACTH (due to release of corticotrophin-releasing hormone (CRH)), β-endorphin, N-terminal precursor, growth hormone (GH) and prolactin. The concentrationof other hormones (thyroid-stimulating hormone (TSH), follicle-stimulating hormone (FSH) and luteinizing hormone (LH)) do not change significantly during physical stress, such is the surgery stress [8].

The most important mediators of mental stress which influence bones regeneration are glucocorticoids, inflammatory cytokines and growth hormones (GH)[7], but GH responses are rarely seen [9].

Recent studies showed that GH can induce osteoblast proliferation and differentiation [7]. Most of the GH's actions are mediated by insulin-like growth factors (IGFs), especially IGF-1, produced in liver, muscles, etc. as a result of GH stimulation [8]. IGF-1 has an anabolic effect and promotes the activity of resident osteoblasts. Increased circulating IGF-1 is detected by the hypothalamus and the pituitary gland and suppresses GH secretion by negative feedback. Nevertheless, stress alters this feedback loop and, after a while, it can lead to catabolic effects on the bones [7].

Another important factor that should be taken into account is age, which determines an increased activity of the HPA axis; as a result we will notice a higher level of glucocorticoids (cortisol). Therefore, an elderly operated patient, who shares the room with an alcoholic patient, will experience significant increases in glucocorticoids by all three factors: firstly, due to age; secondly, due to mental stress, to which surgical stress is added showing a peak level of cortisol after 4-6 hours after surgery.

To achieve a bone structure with a micro-architecture that is as close as possible to the original one, there must be a balance between bone formation and resorption, i.e. between the activity of osteoblasts and osteoclasts [10]. Osteoblasts and osteocytes are the major target cells of glucocorticoids, but the responses are quite different when it comes to physiologic levels and higher levels [11]. Generally, glucocorticoids play an important role in maintainingbone structure through

induction of osteogenic differentiation of progenitor cells [11], [12]. Moreover, glucocorticoids influence the transport and function of leukocytes and inhibit the production of pro-inflammatory cytokines; *in vivo* studies showed that chronic stress determines GR resistance, which plays a major role in the development of osteoporosis [12], [13].

High levels of cytokines, such as IL-6, IL-1β and TNF, are also secreted by the corticotrophin-releasing hormone (CRH), suppress the function of osteoblasts and initiate osteoclastogenesis leading to osteoporosis.

In these cases, recent studies showed that the only antiosteoporotic treatment with double action mechanism (on bone formation and bone resorption) is strontium ranelate. Although it has some cardiovascular contraindications, strontium ranelate is the best choice for bone healing due to its properties to inhibit osteoclasts, improve osteoblasts activity and reduce osteoblasts apoptosis as well, thus obtaining fast and qualitative bone healing [10].

In addition, physical stress (surgery stress) transmits nociceptive signals by small myelinated (A-delta) and unmyelinated sensory afferent fibers, which seems to have more implications. Studies suggest that these fastconductingfibers may be involved in the endocrine and metabolic responses.

Physical Stress

After fracture, blood vessels break down and determine the formation of hematoma and specific inflammation, then fibrocartilaginous callus formation and ultimately bone callus, butcomplete healing may take up to a few months depending on the nature of the fracture and the specific function of the affected member. Therefore, in order to fix the fracture, osteosynthesis materials are needed to ensure bone integrity for this period of time. Nevertheless, the metallic material causes bone stress and predisposes to osteoporosis, so that the bone may not recover completely until the material is extracted.

To reduce elements of any additional physical stress, methods of imposing the existing osteosynthesis materials (plaques, prostheses) have been studied so as to obtain an integration as anatomical as possible for a quick recovery and better mobility in patients, improved quality, reliable biocompatibility and modularity.

One of the most common fractures in the upper limb is the radial head fracture of the elbow. For those patients with comminuted and irreparable fractures, polyethylene bipolar prostheses have been created, and rapid mobilization and rehabilitation, better joint tracking by multiple movements and angulations were observed [14].

It is also known that the success of fracture healing depends on the mechanical conditions inthe fracture healing zone, the anatomical location of the fracture (metaphyseal – epiphyseal or diaphyseal) [15].

Initially, immediately after injury, polymorphonuclear neutrophils (PMNs) are attracted, and then macrophages (attracted by chemokines) take part in endocondral ossification. Then lymphocytes migrate and numerous pro-inflammatory cytokines are released, prostaglandins (generated by cyclooxygenase (COX) enzyme, involved in the regulation of HPA axis activity), interferons, prostanoids, nitric oxide (which participates in multiple interactions between neuroendocrine and neuroimmune systems) and transcription factors [14], [16].

Acute stress affects the functionality of COX-prostaglantine and NO synthase-NO [16].

Psychological stress influences the oxytocin and glucocorticoids levels, catecholamine and health behaviors, which will determine a lower level of pro-inflammatory cytokines (interleukins, TNF-α) and matrix metalloproteinase enzymes, increased wound hypoxia, reduced neutrophils infiltration and antimicrobial peptides and increased risk of bacterial and microbial infection leading to impaired wound healing [17].

## 3. Conclusions

Each patient has an individual way of adapting to stress and tolerance. In the case of surgically treated patients, a combination of stress factors may be observed: the pre-existing stress

of the patient (daily problems, depression, fear, menopause, other comorbidities, age), surgical stress causing an increase in inflammatory factors (cytokines, interleukins) and metabolism (to maintain the body's homeostasis). When these patients are hospitalized in the same room with alcohol withdrawal patients (delirium tremens, psychomotor agitation), significant mental stress acts on common axes with surgical stress (HPA, stimulates glucocorticoid secretion - cortisol, ACTH), but also on new axes that will only create a more conducive environment for long and complicated healing.

Therefore, in order to improve the quality of postoperative care and its effects, as well as to reduce the costs and duration of hospitalization, the most appropriate way to manage such patients (alcohol withdrawal) is to isolate them and ensure the necessary medication, both for the benefit of the patient himself, and for the benefit of other hospitalized patients.

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